FIG. 1 (PRIORT ART)

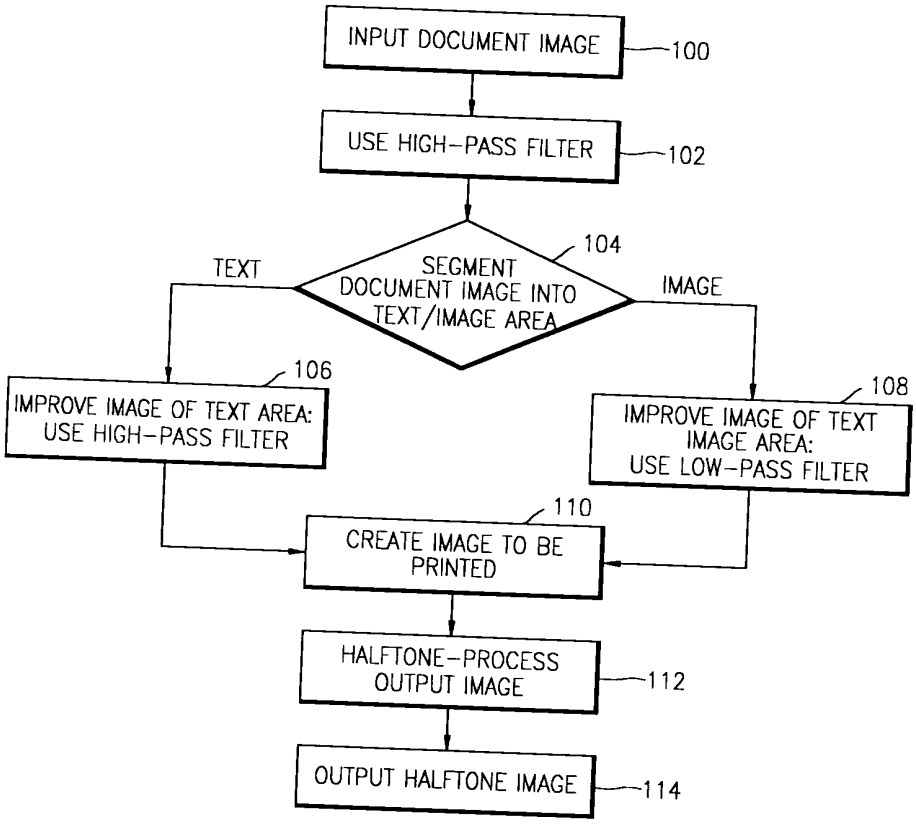


FIG. 2

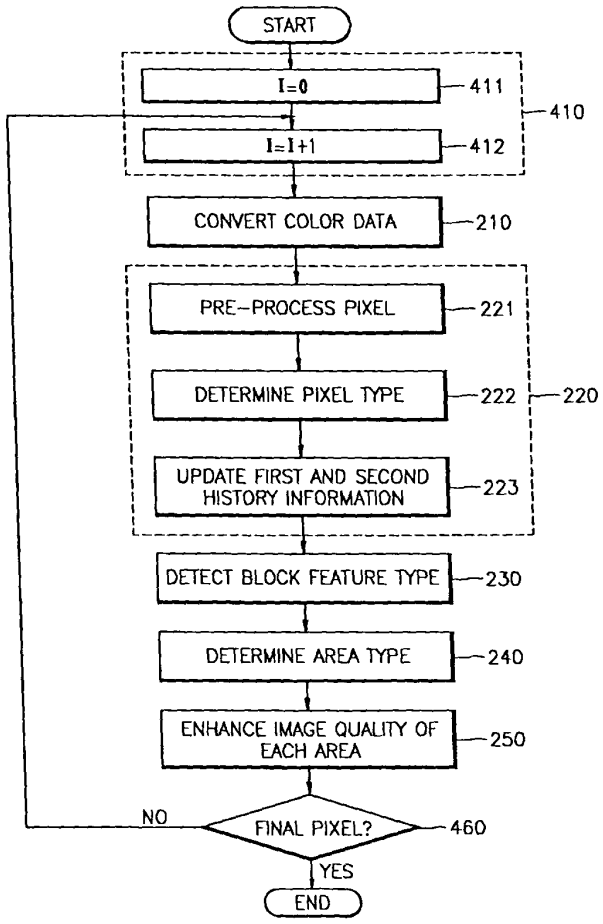

START
I=0
411
410
I=I+1
412
CONVERT COLOR DATA
210
PRE-PROCESS PIXEL
221
DETERMINE PIXEL TYPE
222
220
UPDATE FIRST AND SECOND HISTORY INFORMATION
223
DETECT BLOCK FEATURE TYPE
230
DETERMINE AREA TYPE
240
ENHANCE IMAGE QUALITY OF EACH AREA
250
NO
FINAL PIXEL?
460
YES
END

FIG. 3A

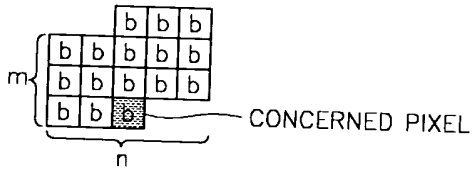


FIG. 3B

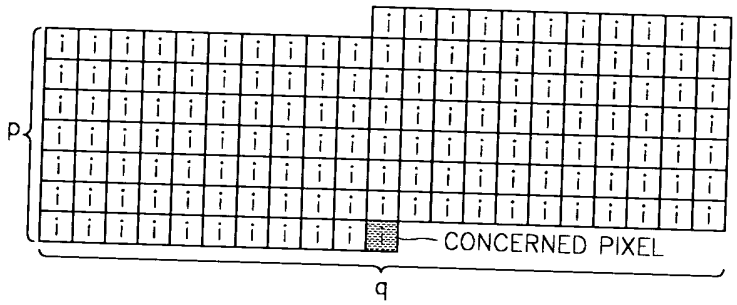


FIG. 3C

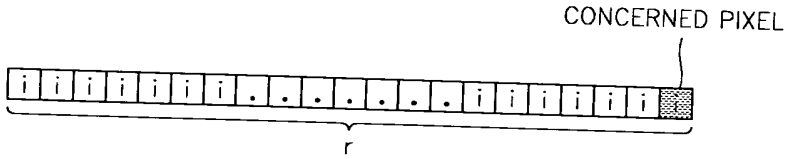


FIG. 4

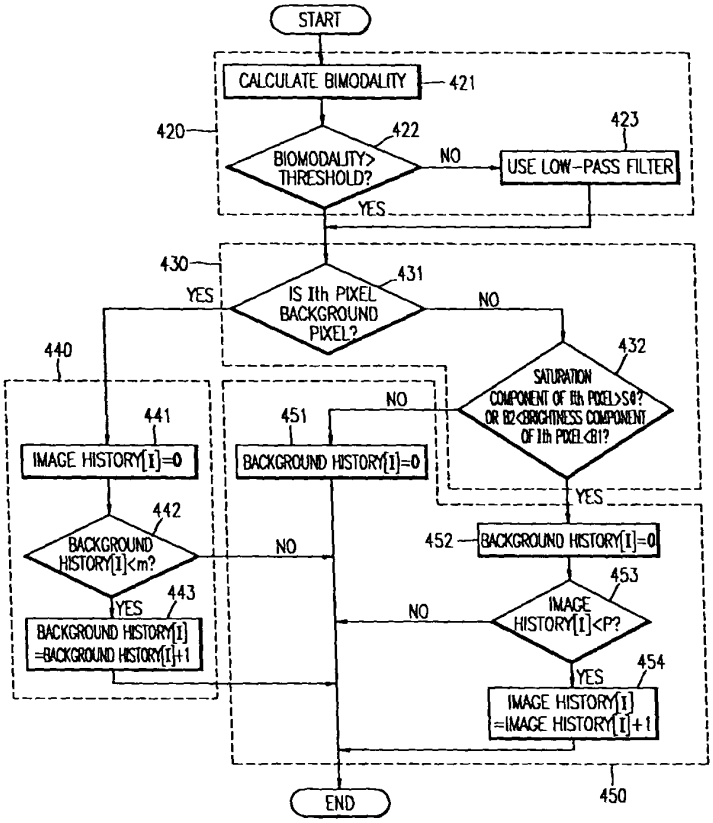

START
CALCULATE BIMODALITY
421
420
422
BIMODALITY> THRESHOLD?
NO
423
USE LOW-PASS FILTER
YES
430
IS Ith PIXEL BACKGROUND PIXEL?
431
YES
NO
440
432
SATURATION COMPONENT OF Ith PIXEL>S0? OR B2<BRIGHTNESS COMPONENT OF Ith PIXEL<B1?
NO
441
IMAGE HISTORY[I]=0
451
BACKGROUND HISTORY[I]=0
YES
442
BACKGROUND HISTORY[I]<m?
NO
452
BACKGROUND HISTORY[I]=0
YES
443
BACKGROUND HISTORY[I] =BACKGROUND HISTORY[I]+1
453
IMAGE HISTORY[I]<P?
NO
YES
454
IMAGE HISTORY[I] =IMAGE HISTORY[I]+1
END
450

FIG. 5

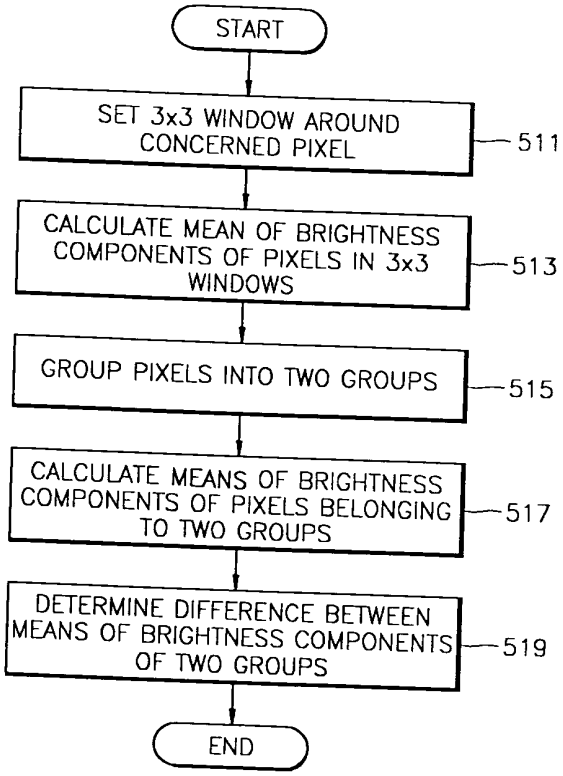

START
SET 3x3 WINDOW AROUND CONCERNED PIXEL
511
CALCULATE MEAN OF BRIGHTNESS COMPONENTS OF PIXELS IN 3x3 WINDOWS
513
GROUP PIXELS INTO TWO GROUPS
515
CALCULATE MEANS OF BRIGHTNESS COMPONENTS OF PIXELS BELONGING TO TWO GROUPS
517
DETERMINE DIFFERENCE BETWEEN MEANS OF BRIGHTNESS COMPONENTS OF TWO GROUPS
519
END

FIG. 6

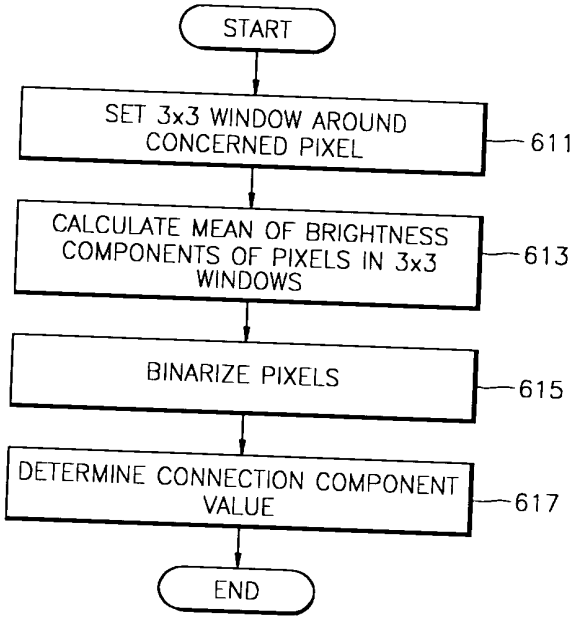

START
SET 3x3 WINDOW AROUND CONCERNED PIXEL
611
CALCULATE MEAN OF BRIGHTNESS COMPONENTS OF PIXELS IN 3x3 WINDOWS
613
BINARIZE PIXELS
615
DETERMINE CONNECTION COMPONENT VALUE
617
END

FIG. 7

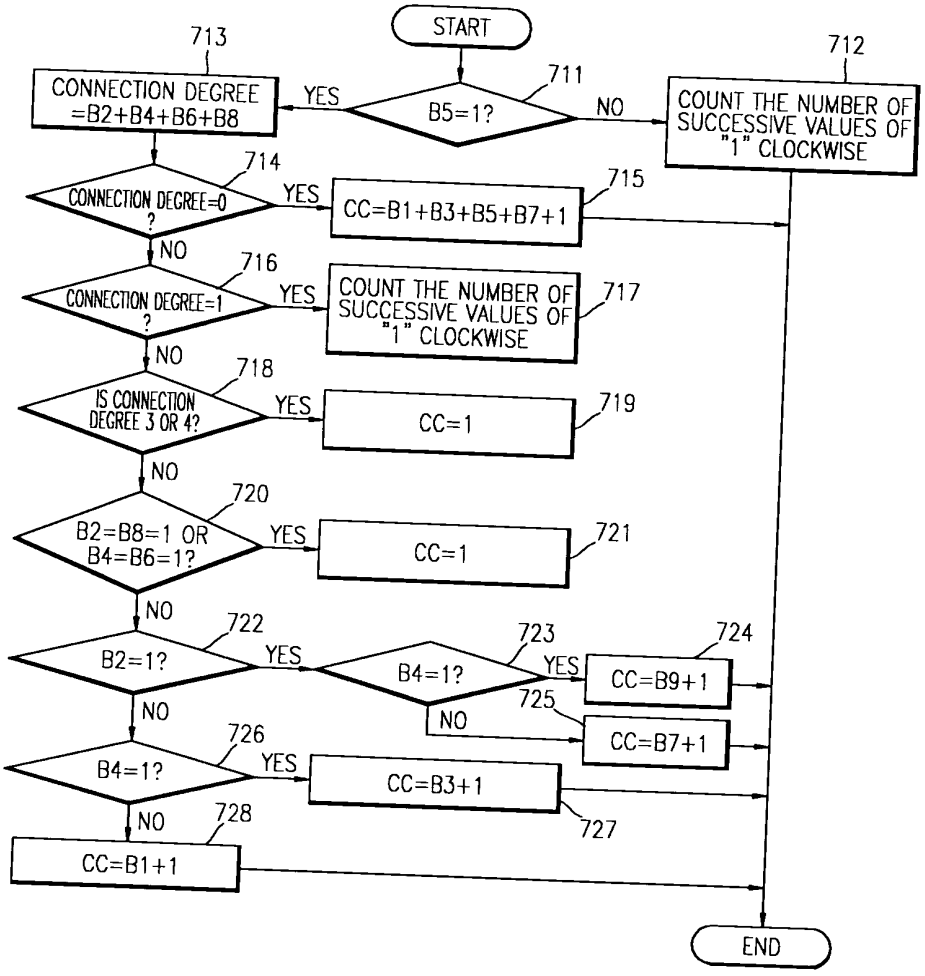

START
711
B5=1?
YES
NO
713
CONNECTION DEGREE =B2+B4+B6+B8
712
COUNT THE NUMBER OF SUCCESSIVE VALUES OF "1" CLOCKWISE
714
CONNECTION DEGREE=0 ?
YES
715
CC=B1+B3+B5+B7+1
NO
716
CONNECTION DEGREE=1 ?
YES
COUNT THE NUMBER OF SUCCESSIVE VALUES OF "1" CLOCKWISE
717
NO
718
IS CONNECTION DEGREE 3 OR 4?
YES
CC=1
719
NO
720
B2=B8=1 OR B4=B6=1?
YES
CC=1
721
NO
722
B2=1?
YES
723
B4=1?
YES
724
CC=B9+1
NO
725
CC=B7+1
NO
726
B4=1?
YES
CC=B3+1
727
NO
728
CC=B1+1
END

FIG. 8

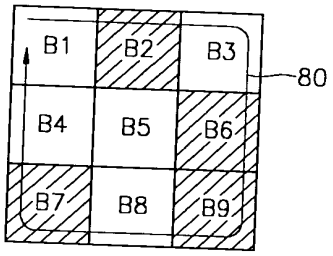
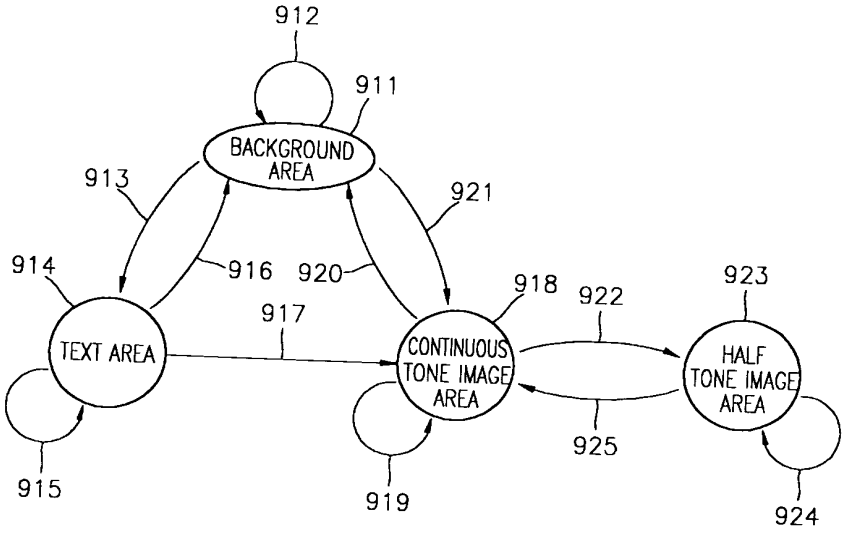

B1
B2
B3
80
B4
B5
B6
B7
B8
B9

FIG. 9


912
911
BACKGROUND AREA
913
921
914
916
920
918
922
923
917
TEXT AREA
CONTINUOUS TONE IMAGE AREA
HALF TONE IMAGE AREA
915
919
925
924

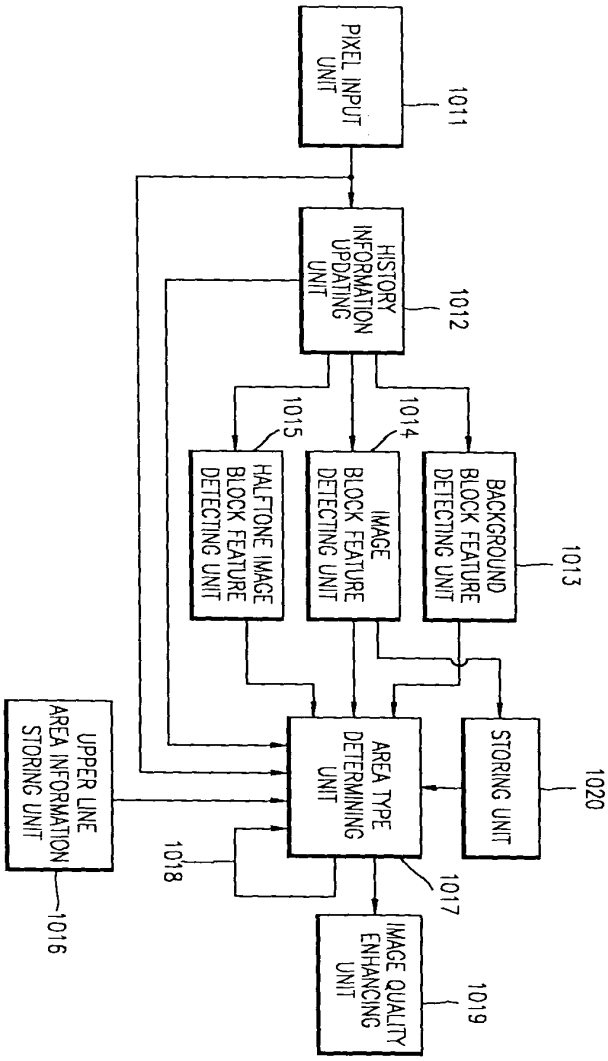

PIXEL INPUT UNIT
1011
HISTORY INFORMATION UPDATING UNIT
1012
BACKGROUND BLOCK FEATURE DETECTING UNIT
1013
IMAGE BLOCK FEATURE DETECTING UNIT
1014
HALFTONE IMAGE BLOCK FEATURE DETECTING UNIT
1015
UPPER LINE AREA INFORMATION STORING UNIT
1016
AREA TYPE DETERMINING UNIT
1017
1018
STORING UNIT
1020
IMAGE QUALITY ENHANCING UNIT
1019

FIG. 10